Circular 83

STATE OF ILLINOIS
OTTO KERNER, *Governor*
DEPARTMENT OF REGISTRATION AND EDUCATION
WILLIAM SYLVESTER WHITE, *Director*

Water-Level Decline and Purn page During I960 in Deep Wells in the Chicago Region, Illinois

by R.T. SASMAN, T.A. PRICKETT, and R.R. RUSSELL

ILLINOIS STATE WATER SURVEY
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WATER-LEVEL DECLINE AND PUMPAGE DURING 1960 IN DEEP' WELLS IN THE CHICAGO REGION, ILLINOIS

by

R. T. Sasman, T. A. Prickett, and R. R. Russell

SUMMARY

The water-level decline during 1960 in deep wells penetrating the Cambrian-Ordovician Aquifer, the most highly developed aquifer for large ground-water supplies in the Chicago region, is considered in this report. The Cambrian-Ordovician Aquifer is encountered at an average depth of about 500 feet below the land surface at Chicago; it has an average thickness of 1000 feet and is composed chiefly of sandstones and dolomites.

Pumpage from deep wells has increased from 200,000 gallons per day (gpd) in 1864 to 88.0 million gallons per day (mgd) in 1959. As a result, artesian pressure in the Cambrian-Ordovician Aquifer at Chicago has declined about 670 feet. Pumpage from deep wells is concentrated in six centers: Chicago area, Joliet area, Elmhurst area, Des Plaines area, Aurora area, and Elgin area.

In 1960, pumpage from deep wells was 91.7 mgd or 3.7 mgd more than in 1959. This annual increase in pumpage has resulted in excessive declines in water levels in deep wells. Water-level declines during 1960 ranged from 11 feet in the Elgin area to 18 feet in the Des Plaines area and averaged about 13 feet„ The 1960 average decline is much greater than the average annual rate of decline (10 feet) for the period 1945-1959.

Withdrawals in 1960 exceed the practical sustained yield of the Cambrian-Ordovician Aquifer as they did in 1959, with the

result that ground-water users in the Chicago region continue to mine water and to borrow water from future generations. If the distribution of pumpage remains the same as in 1960 and pumpage from the Cambrian-Ordovician Aquifer continues to increase in the future, the lowest and most permeable unit of the aquifer will be partially dewatered in many areas much sooner than previously anticipated,, Pumping levels exceeding 1000 feet below the surface will be common within 20 years.

INTRODUCTION

In May 1959 the State Water Survey and the State Geological Survey issued Cooperative Ground-Water Report 1, entitled "Preliminary Report on Ground-Water Resources of the Chicago Region, Illinois."(1) Cooperative Report 1 discussed the geology and hydrology of the ground-water resources of the Chicago region, the yields of aquifers, and the possible consequences of future ground-water development. Special emphasis was placed on the deep water-yielding aquifers which have been most widely used for large ground-water supplies. Studies described in Cooperative Report 1 indicated that pumpage from deep wells during 1958 approached the amount that could be continuously withdrawn without eventually dewatering the lowermost and most productive formation of the deep aquifer. Future (1958-1980) water-level declines, ranging from

(1) Suter, Max, Bergstrom, R. E., Smith, H. F., Emrich, G. H., Walton, W. C., and Larson, T. E., 1959, Preliminary Report on Ground-Water Resources of the Chicago Region, Illinois: Cooperative Ground-Water Report 1, Illinois State Water Survey and State Geological Survey.

190 feet at Elgin to 300 feet at Chicago and Des Plaines, were predicted,, It was recognized that actual water-level declines will vary from predicted declines given in the report if future distribution and rates of pumpage deviate from extrapolations of past ground-water use,, As a result of the findings of Cooperative Report 1, the program of collecting and reporting water-level and pumpage data for deep wells in the Chicago region, which is one of the functions of the State Water Survey, was accelerated in 1959.

The objectives of the program are (1) to provide a year to year evaluation of trends in water levels and pumpage, (2) to delineate problem areas, (3) to provide long-term continuous records of fluctuations of water levels and pumpage, and (4) to collect and report all hydrologic information which will facilitate the planning and development of the water resources of the deep aquifer in the Chicago region. The program is particularly urgent at this time due to the progressively increasing demands; for water supplies and the continuing decline of water levels.

In May 1960 the State Mater Survey issued Circular 79* entitled "Water Level Decline and Pumpage During 1959 in Deep Wells in the Chicago Region, Illinois,"(2) This report summarized the trends in water levels and pumpage from deep wells during 1959. Pumpage from deep wells in 1959 was 88.0 mgd or 9.7 mgd more than in 1958. This annual increase in pumpage was record high, exceeded the practical sustained yield (46 mgd) of the deep aquifer, and

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(2) Walton, W. C., Sasman, R. T., and Russell, R. R., 1960, Water Level Decline and Pumpage During 1959 in Deep Wells in the Chicago Region, Illinois: Circular 79, Illinois State Water Survey.

resulted in excessive declines in water levels in deep wells. Water-level declines during 1959 ranged from 9 feet in the Joliet area to 41 feet in the Elmhurst area and averaged about 20 feet in the Chicago region. The 1959 average decline was much greater than the average annual rate of decline (10 feet) for the period 1945-1958.

This report summarizes trends in water levels and pumpage from deep wells during 1960. A summary of the essential findings of Cooperative Report 1 and Circular 79 regarding the deep aquifers is presented to serve as a background for interpretation of the records.

GEOLOGY AND HYDROLOGY OF CAMBRIAN-ORDOVICIAN AQUIFER

Ground—water resources in the Chicago region are developed from four aquifer systems: (1) sand and gravel deposits of the glacial drift; (2) shallow dolomite formations, mainly of Silurian age; (3) the Cambrian-Ordovician Aquifer; and (4) the Mt. Simon Aquifer. This report is concerned with the Cambrian-Ordovician Aquifer.

The Cambrian-Ordovician Aquifer consists in downward order of the Galena-Platteville Dolomite, Glenwood-St. Peter Sandstone, and Prairie du Chien Series of Ordovician age; Trempealeau Dolomite, Franconia Formation, and Ironton-Galesville Sandstone of Cambrian age. The sequence, structure, and general characteristics of these rocks are shown in figure 1. The Cambrian-Ordovician Aquifer is separated from the Mt. Simon Aquifer by shale beds of the Eau Claire Formation. The Maquoketa Formation above the Galena-Platteville Dolomite acts as a barrier between the shallow dolomite and deeper

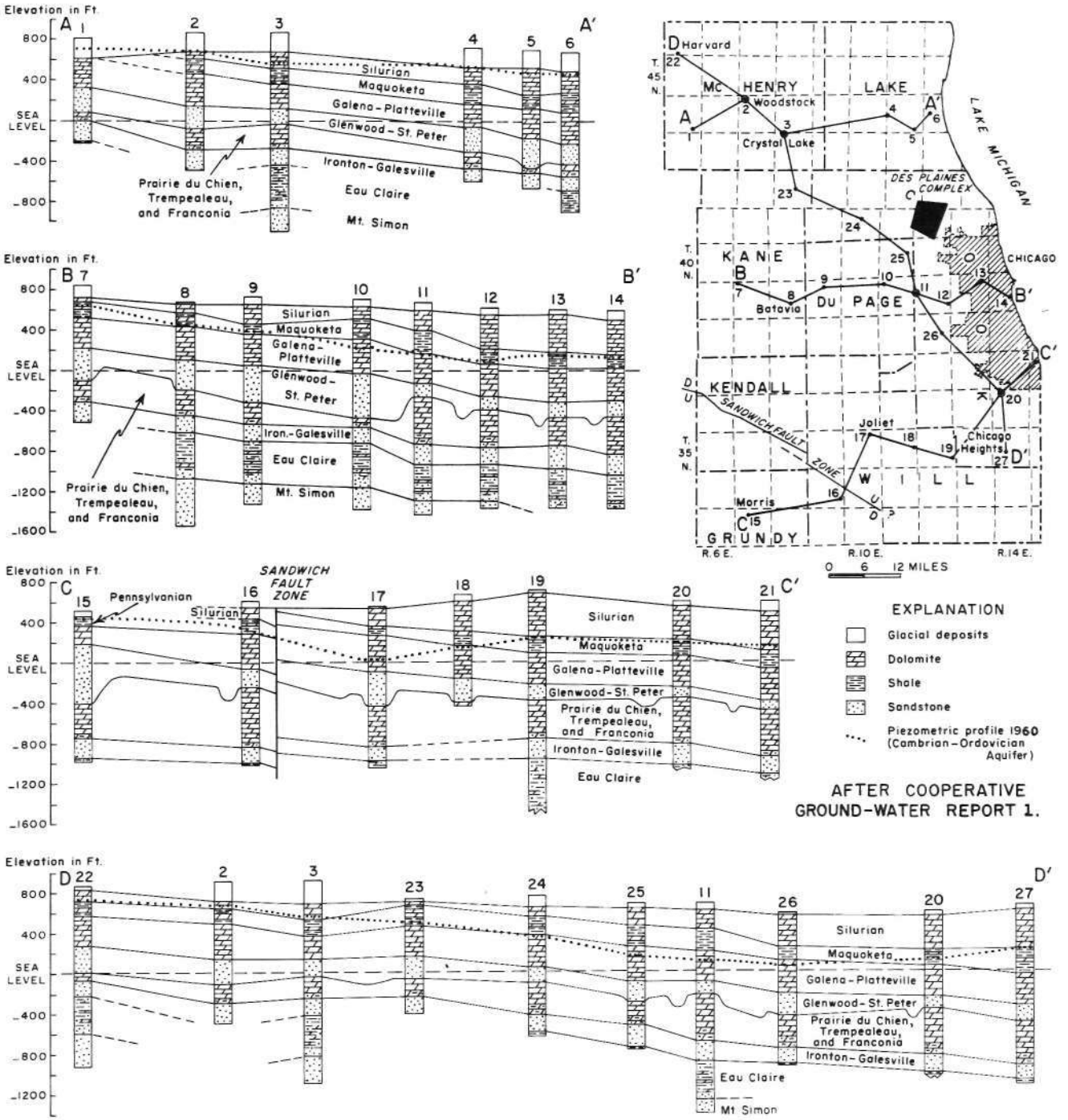


FIGURE 1. CROSS SECTIONS OF THE STRUCTURE AND STRATIGRAPHY OF THE BEDROCK AND PIEZOMETRIC PROFILES OF THE CAMBRIAN-ORDOVICIAN AQUIFER IN THE CHICAGO REGION

aquifers and confines the water in the deeper aquifers under artesian pressure. Available data indicate that on a regional basis the entire sequence of strata, from the top of the Galena-Platteville to the top of the shale beds of the Eau Claire Formation, behaves hydraulically as one aquifer.

The Ironton-Galesville Sandstone is the most productive formation of the Cambrian-Ordovician Aquifer. The Galena-Platteville Dolomite and Prairie du Chien Series generally are not well creviced and are not major contributors. The Trempealeau Dolomite is locally well creviced.

The Cambrian-Ordovician Aquifer receives water from overlying glacial deposits mostly in areas of Kane, McHenry, Kendall, Boone, and DeKalb Counties where the Galena-Platteville Dolomite is the uppermost bedrock formation below the glacial deposits. This is west of the border of the Maquoketa Formation. Recharge of the glacial deposits occurs from precipitation that falls locally. Vertical leakage of water through the Maquoketa Formation into the Cambrian-Ordovician Aquifer is becoming appreciable under the influence of large differentials in head between shallow deposits and the Cambrian-Ordovician Aquifer.

PUMPAGE FROM DEEP WELLS

The first deep well in Chicago, drilled at the corner of Chicago and Western Avenues in l864, had an artesian flow estimated at about 150 gallons per minute (gpm) or about 200,000 gpd. The estimated pumpage from deep wells in the Chicago region increased gradually from 200,000 gpd in 1864. to 88 mgd in 1959 as shown in figure 2.

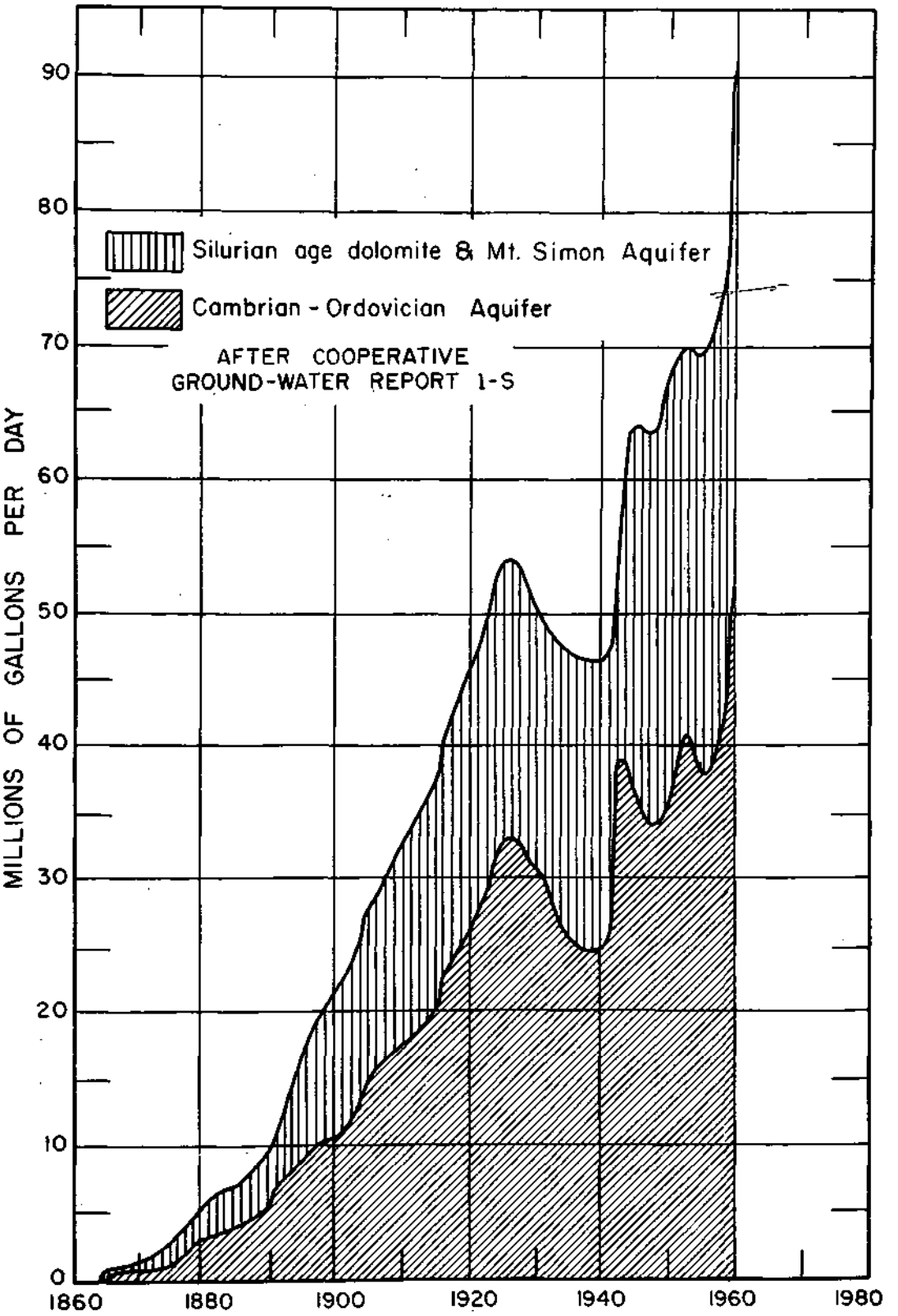


Figure 2. PUMPAGE FROM DEEP WELLS, 1864 THROUGH 1960, SUBDIVIDED BY SOURCE

Many deep wells in the Chicago region are either uncased or faultily cased in the Silurian age dolomite and allow leakage. The Mt. Simon Aquifer also is penetrated by a large number of deep wells, particularly along the Pox River in Kane County. The artesian pressure of the Cambrian-Ordovician Aquifer is lower than that in the Silurian age dolomite and Mt. Simon Aquifer. Ground water, therefore, moves downward from the dolomite and upward from the Mt. Simon into the Cambrian-Ordovician Aquifer through wells that are open in all three aquifers. Thus, water pumped from deep wells does not come from the Cambrian-Ordovician Aquifer alone. It is estimated that of the 88 mgd pumped from deep wells in 1959, 50 mgd came from the Cambrian-Ordovician Aquifer, 24 mgd came from the Silurian age dolomite, and 14. mgd came from the Mt. Simon Aquifer.

Pumpage in 1960

During 1960 pumpage from deep wells increased from 88.0 mgd to 91.7 mgd, an increase of 3.7 mgd. This increase is less than 40 per cent of the increase during 1959. Total pumpage in 1960 was about 4 per cent greater than total pumpage in 1959. It is estimated that of the 91.7 mgd pumped from deep wells during 1960, 52.3 mgd came from the Cambrian-Ordivician Aquifer, and 39.4 mgd came from the Silurian age dolomite and Mt. Simon Aquifer.

Pumpage is concentrated in six centers: the Chicago, Joliet, Elmhurst, Des Plaines, Aurora, and Elgin areas. Distribution of pumpage from deep wells in 1958, 1959, and 1960 is shown in table 1. The greatest quantities of water were withdrawn from deep wells in the Chicago, Joliet, and Aurora areas.

Table 1 - Distribution of Pumpage from Deep Wells in 1958, 1959, and 1960

Pumping Center	Total pumpage (mgd)			Pumpage increase (mgd)	
	1958	1959	1960	1958-1959	1959-1960
Chicago area	23.6	24.9	24.9	1.3	negligible
Joliet area	16.5	18.9	20.2	2.4	1.3
Elmhurst area	9.3	10.7	10.7	1.4	negligible
Des Plaines area	9.2	10.9	12.1	1.7	1.2
Elgin area	6.8	7.5	7.7	0.7	0.2
Aurora area	12.9	15.1	16.1	2.2	1.0
Total	78.3	88.0	91.7	9.7	3.7

Pumpage increases, 1959-1960, in all pumping centers were much less than pumpage increases, 1958-1959. As shown in table 1, pumpage increases, 1959-1960, in the six pumping centers ranged from negligible in the Chicago and Elmhurst areas to 1.3 mgd in the Joliet area. Pumpage increases exceeding 1.0 mgd were recorded for the Joliet, Des Plaines, and Aurora areas. The rate of pumpage increase, 1959-1960, is more than 4 times the average annual rate of pumpage increase, l864.-1958.

During 1960, 10 new deep wells were placed in operation. Of these wells, 5 were drilled to augment existing municipal wells or to develop new municipal or subdivision water supply systems. A number of deep wells and deep well pumps were rehabilitated to meet increased demands.

The distribution of pumpage in 1959 and 1960, subdivided by use, is shown in figure 3 and in table 2. Public use includes municipal and institutional pumpage. No attempt has been made to determine the final use of water within categories. Any water pumped by a municipality is called a public supply, regardless of the use of the water.

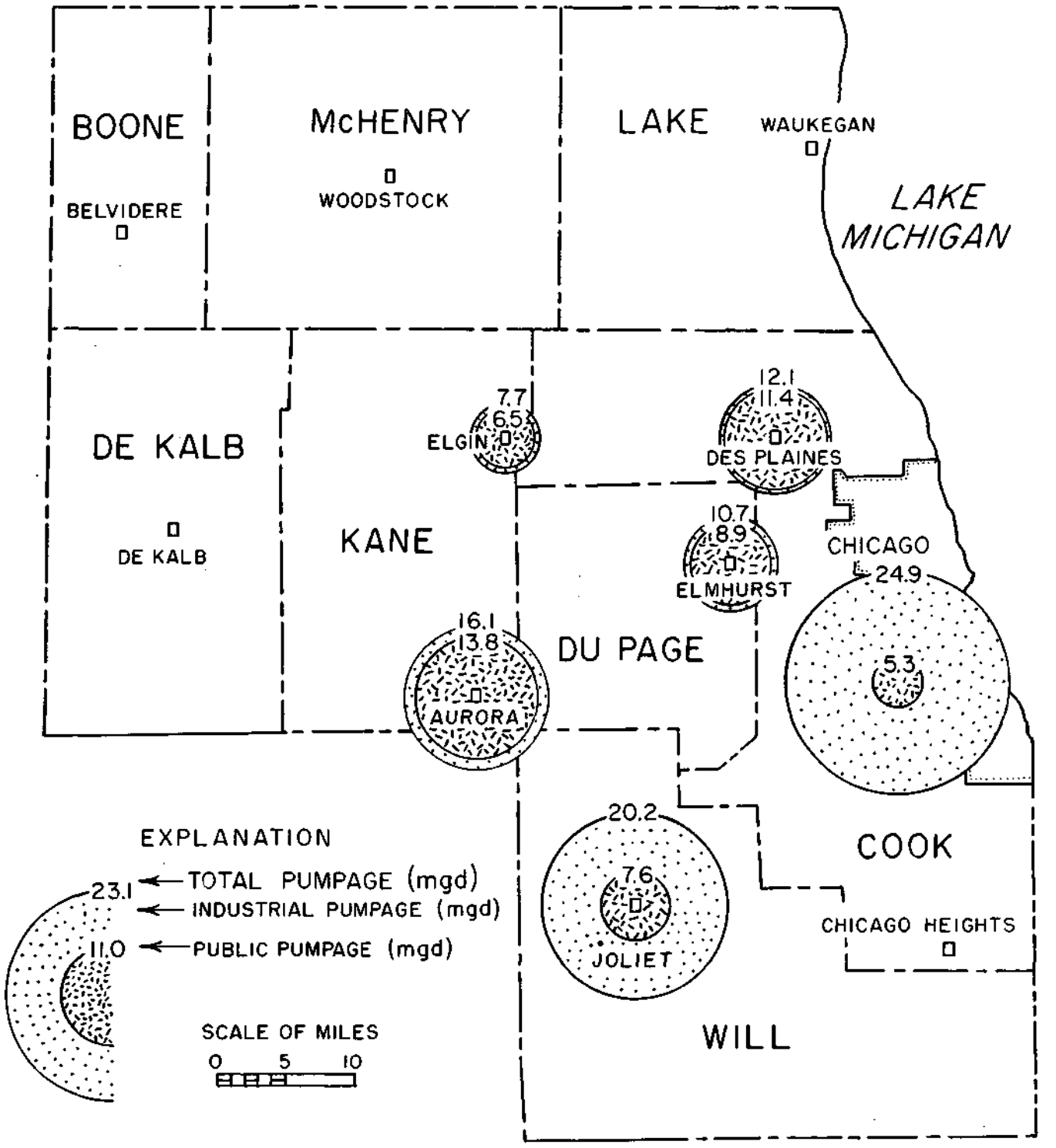


Figure 3. DISTRIBUTION OF ESTIMATED PUMPAGE FROM DEEP WELLS IN 1960

Table 2 - Distribution of Pumpage from Deep Wells in 1959 and 1960, Subdivided by Use

Pumping Center	Public pumpage (mgd)		Industrial pumpage (mgd)	
	1959	1960	1959	1960
Chicago area	4.7	5.3	20.2	19.6
Joliet area	7.4	7.6	11.5	12.6
Elmhurst area	9.0	8.9	1.7	1.8
Des Plaines area	10.2	11.4	0.7	0.7
Elgin area	6.6	6.5	0.9	1.2
Aurora area	13.1	13.8	2.0	2.3
Total	51.0	53.5	37.0	38.2

In 1960 withdrawals for public water-supply systems amounted to about 58 per cent of the total pumpage;: industrial pumpage was about 42 per cent of the total. Municipal pumpage was 48.4 mgd or 90 per cent of the total public pumpage. Municipal pumpage continues to be by far the greatest use in the Elmhurst, Des Plaines, Elgin, and Aurora areas,, Most industrial pumpage is concentrated in the Chicago and Joliet areas. Public pumpage in 1960 was about 5 per cent greater than in 1959; industrial pumpage in 1960 was about 3 per cent greater than in 1959.

Public pumpage increases, 1959-1960, were greatest in the Des Plaines area (1.2 mgd); in the Elmhurst and Elgin areas there was a decrease of 0.1 mgd in the public pumpage. Increases in public pumpage of 0.6 mgd, 0.2 mgd, and 0.7 mgd were reported in the Chicago, Joliet, and Aurora areas, respectively. Much of the increase in public pumpage was recorded for deep wells owned by large municipalities, such as Arlington Heights, Bellwood, Des Plaines, Elgin, Joliet, Lombard, Mt. Prospect, and St. Charles. A number of subdivisions also showed a considerable increase in pumpage. Municipal pumpage from deep wells decreased at some

municipalities, such as Aurora, Elmhurst, Geneva, and Villa Park. Of the twelve municipalities which pumped more than 1.0 mgd during 1960, eight recorded an average increase of 0.2 mgd and four recorded an average decrease of 0.1 mgd.

Industrial pumpage increased 1.1 mgd in the Joliet area where several industries increased their use of ground water. Industrial pumpage in the Chicago area decreased 0.6 mgd. The other four areas reported negligible change or small increases (0.1 to 0.3 mgd) in industrial pumpage. In the Chicago region, seven industries reported pumpage of more than 1.0 mgd in 1960, two reported an average increase of 0.6 mgd, three reported an average decrease of 0.1 mgd, and two reported negligible change in pumpage during 1960. Data on industrial pumpage were obtained at 114 plants. As in previous years, a few industries abandoned their deep wells and converted to municipal systems, and a few industries developed new deep well supplies. Total industrial pumpage increased 1.2 mgd.

In the six pumping centers, only one municipality developed a new deep well water supply during 1960s two subdivisions developed new deep well supplies. One municipality rehabilitated an existing shallow ground-water supply and placed its deep well on a stand-by basis.

Practical Sustained Yield of Cambrian-Ordovician Aquifer in Relation to Pumpage in 1960

In Cooperative Report 1 it was estimated that the practical sustained yield of the Cambrian-Ordovician Aquifer is about 46 mgd and would be developed when the total pumpage from deep wells is

about 81 mgd. The practical sustained yield of the aquifer is the maximum amount of water that can be withdrawn without eventually dewatering the most productive water-yielding formation, the Ironton-Galesville Sandstone. The practical sustained yield is largely limited by the rate at which water can move from recharge areas eastward through the aquifer to pumping centers.

Based on past records of pumpage and water levels, it was estimated in Cooperative Report 1 that the practical sustained yield would be exceeded by 1965. However, total pumpage from deep wells in 1959 and in 1960 actually exceeded the withdrawal rate anticipated for 1965. Thus, the practical sustained yield of the aquifer was exceeded in 1959, and during 1960 ground-water users in the Chicago region continued to mine water and to borrow water from future generations. Sustained pumping at the 1960 rate will result in the dewatering of the Ironton-Galesville Sandstone in many parts of the Chicago region much sooner than anticipated in Cooperative Report 1 with a great and continual reduction in yields of wells.

WATER LEVELS IN DEEP WELLS

In 1864 the artesian pressure in the Cambrian-Ordovician Aquifer was sufficient to cause wells to flow in many parts of the Chicago region. The average elevation of water levels in deep wells at Chicago and at Joliet was probably about 700 feet. As a result of continued heavy pumping, the nonpumping water levels in deep wells declined in 1959 to elevations of 50 feet at Summit southwest of Chicago and 25 feet at Joliet. Prom 1864-1959 the artesian pressure at Chicago declined about 670 feet. The average rate of decline l864-1959 was about 7 feet

per year. The greatest water-level declines in the Chicago region, amounting to more than 650 feet, have occurred in areas of heavy pumpage at Summit and at Joliet. The total decline has been 10 feet or less in recharge areas in Boone and DeKalb Counties.

Examples of long-term fluctuations in water levels in the Chicago region are shown in figures 4 and 5. Hydrographs of observation wells in the Cambrian-Ordovician Aquifer show a steady decline of water levels largely as a result of the continued increase of withdrawals by municipalities, industries, institutions, and commercial establishments as shown in figure 2. The locations of the observation wells for which hydrographs are given in this report are shown in figure 6.

The average annual rates of decline for the period 1945 through 1959 in pumping centers are given in table 3.

Table 3 - Decline in Nonpumping Water Levels, 1945-1959, October 1958 to October 1959, and October 1959 to October 1960

Pumping Center	Average decline 1945- 1959 (feet per year)	Average decline (feet) 0ct. 1958- Oct. 1959	Oct. 1959- Oct. 1960
Chicago area	8	13	13
Joliet area	7	9	12
Elmhurst area	14	41	12
Des Plaines area	13	26	18
Elgin area	11	15	11
Aurora area	9	16	13

Prom 1945 through 1959, the average annual decline in water levels ranged from 14 feet in wells in the Elmhurst area to 7 feet in wells near the center of Jolieto The average annual decline exceeded 10 feet in the Elmhurst, Des Plaines, and Elgin areas.

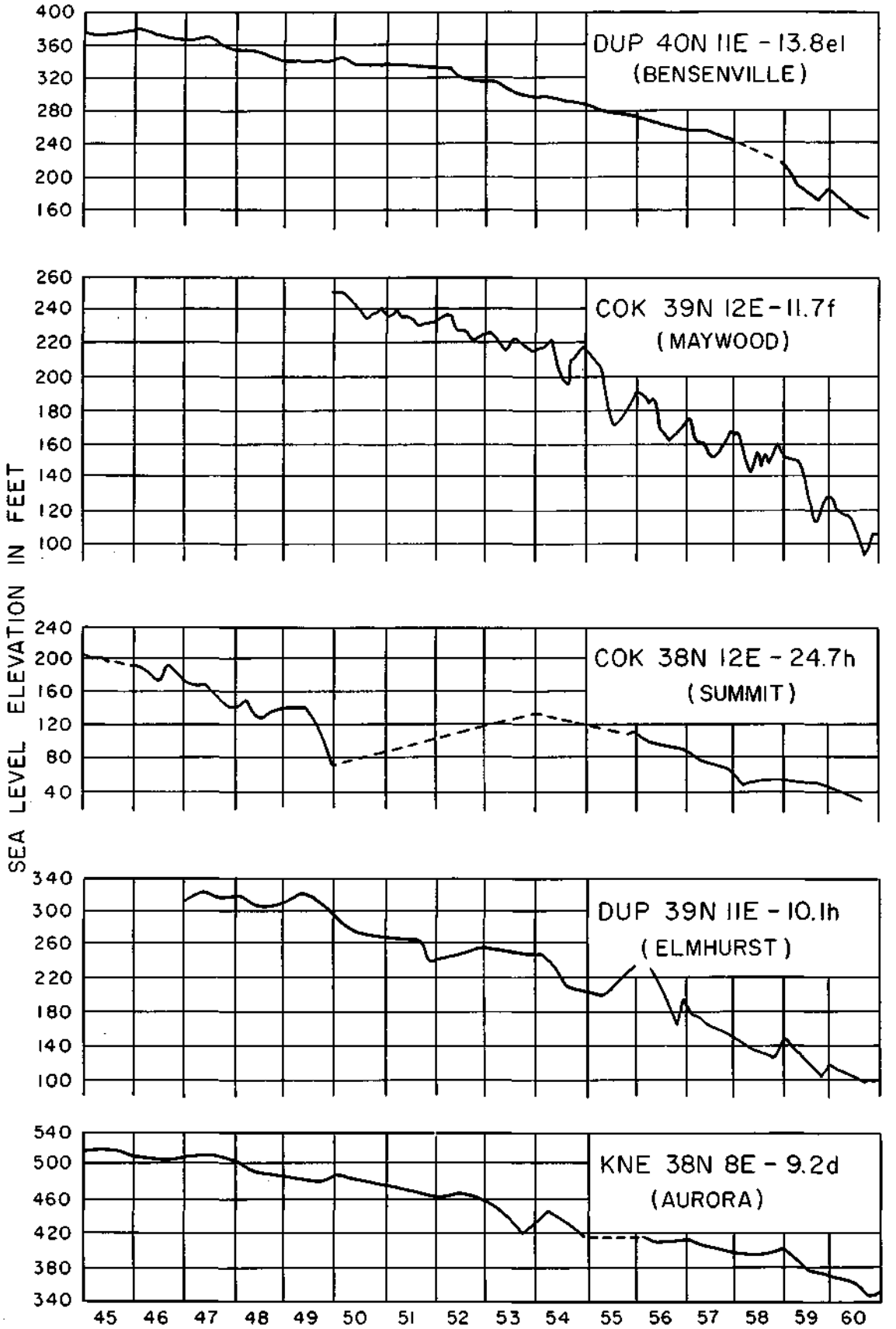


Figure 4. WATER LEVELS IN DEEP WELLS IN THE CHICAGO, DES PLAINES, ELMHURST, AND AURORA PUMPING CENTERS, 1945 — 1960

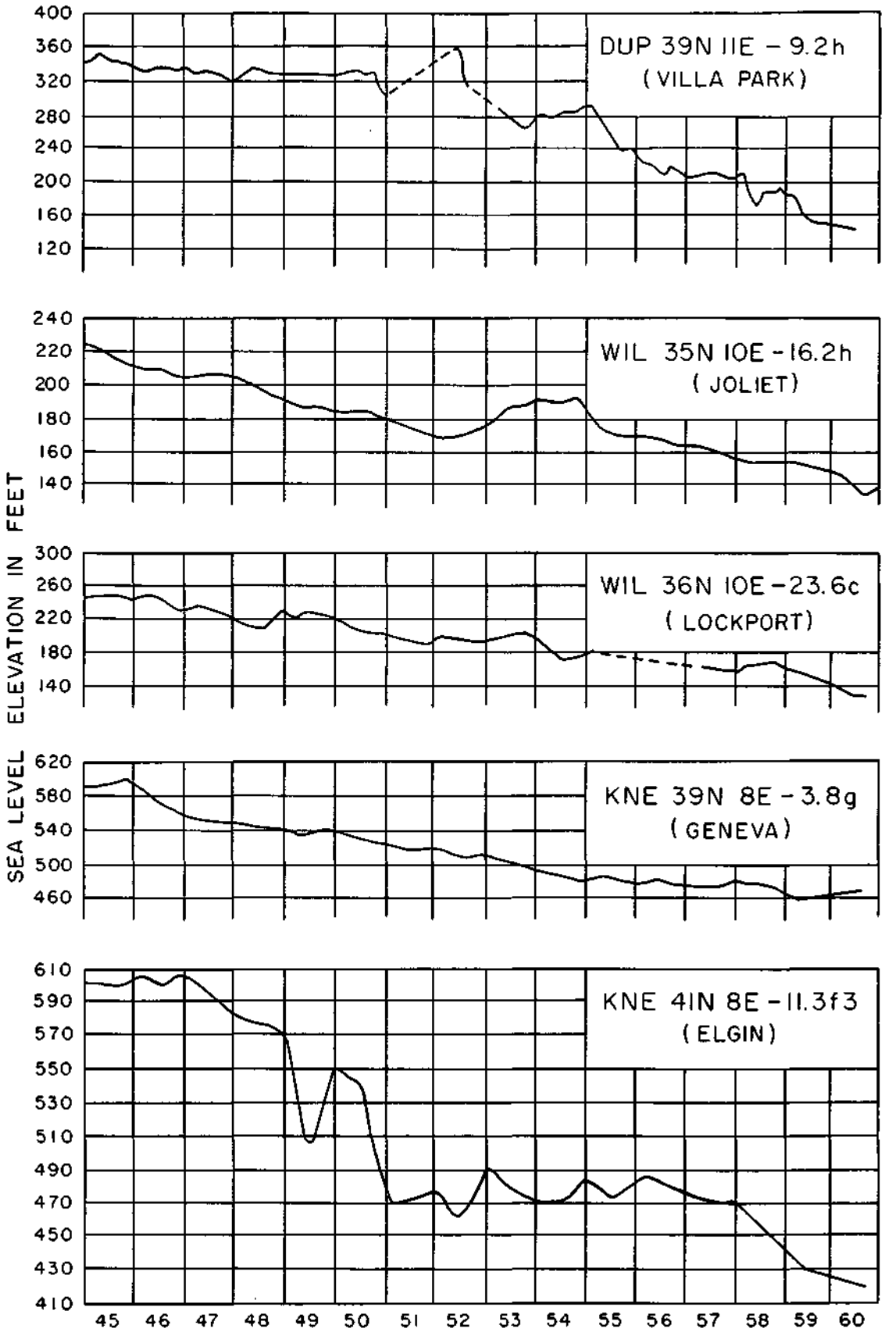


Figure 5. WATER LEVELS IN DEEP WELLS IN THE JOLIET, ELGIN, AND ELMHURST PUMPING CENTERS, 1945 — 1960

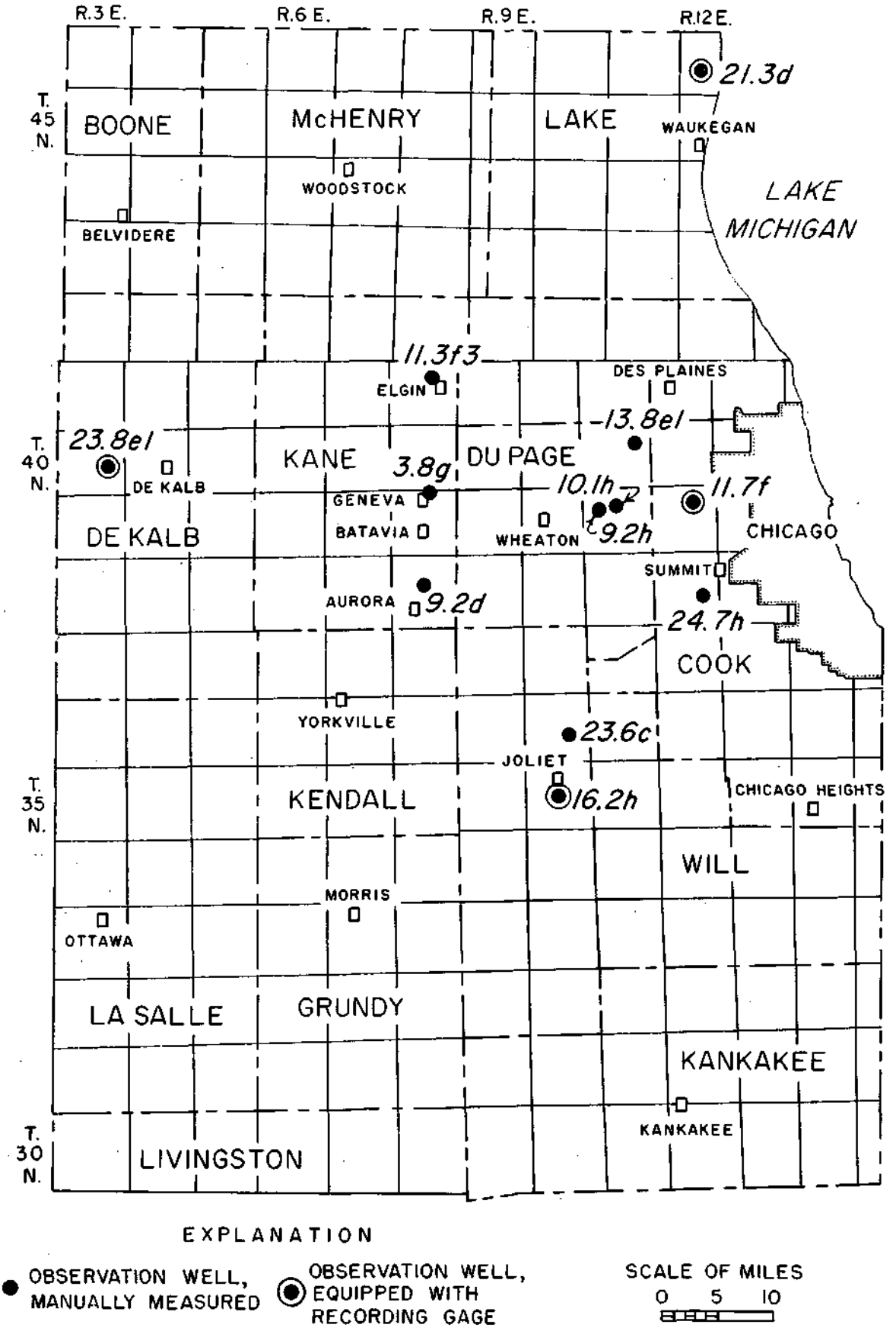


Figure 6. MAP SHOWING LOCATION OF SELECTED OBSERVATION WELLS

Water-Level Decline, October 1959 to October 1960

The water levels in 240 deep wells in the Chicago region were measured during the last week in October and the first week in November, 1960. Data for the wells are given in table 4. Water levels in 143 of these wells were also measured during the same period in 1959. Water-level data for 1959 were compared with data for 1960; computed declines and rises are given in table 5. Computed declines and rises and the piezometric surface maps for 1959 and 1960 were used to construct figure 7. Data were not sufficient to accurately describe water-level changes in the southern parts of Will and LaSalle Counties and in Grundy, Kankakee, and Livingston Counties. The average declines in nonpumping water levels, October 1959 to October 1960, for each pumping center based on figure 7 are given in table 3.

As shown by figure 7 the water-level decline varies from place to place within pumping centers. For example, water levels in deep wells in some places in the Chicago area pumping center recovered; however, on an average water levels declined about 13 feet. The greatest average decline occurred in the Des Plaines area pumping center; the least average decline was recorded for the Elgin area pumping center. Average declines exceeding 10 feet were computed in all pumping centers.

The increase in pumpage in 1960 (3.7 mgd) was much less than the increase in pumpage during 1959 (9.7 mgd), and as a result, the time-rate of water-level decline decreased greatly during 1960. Average declines during 1960 were several feet less than average declines during 1959 in the Elmhurst, Des Plaines, Elgin, and

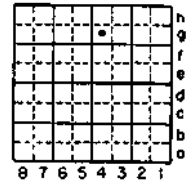
Table 4 - Water Levels in Deep Wells in Northeastern Illinois in 1960
Elevations in Feet Above Mean Sea Level

	Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
*BNE	44N3E-24.8a	City of Belvidere	870	780	50	730	11/2
BNE	44N3E-25.8b	City of Belvidere	1803	765	12	753	11/2
BNE	44N3E-26.1el	City of Belvidere	1800	778	65	713	11/2
BNE	44N3E-35.le2	City of Belvidere	610	800	61	739	11/2
COK	42N12E-2.5b	Green Acre Countrv Club	1362	655	299	356	10/24
COK	42N12E-14.2cl	Sunset Ridge Country Club	1385	655	352	303	10/24
COK	42N12E-23.5f3	Holy Ghost Convent	1451	648	340	308	11/4
COK	42Nl2E-28.7e	Signode Steel Strapping Co.	1452	670	302	368	11/3
COK	42N12E-29.la	Illinois Municipal Water Co.	1405	677	385	292	11/3
COK	42N12E-33.2c	Illinois Municipal Water Co.	917	670	375	295	11/3

-;:-The well numbering system used in this report is based on the location of the well, and uses the township, range, and section for identification.

The well number consists of five parts: county abbreviation, township, range, section, and coordinate within the section. Sections are divided into rows of one-eighth mile squares. Each one-eighth mile square contains 10 acres and corresponds to a quarter of a quarter of a quarter section. A normal section of one square mile contains eight rows of eighth-mile squares; an odd-size section contains more or fewer rows. Rows are numbered from east to west and lettered from south to north as shown below.

Cook County
T.41N., R. 11E.
sec. 25



The number of the well shown in sec. 25 above is as follows:

COK 41N11E-25.4g.

Where there is more than one well in a 10-acre square they are identified by arablc numbers after the lower case letter in the well number.

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
COK 42N11E-ll.6e	Village of Wheeling	1370	645	357	288	10/24
COK 42N11E-11.8b2	Ekco Foil Container Corp.	1320	650	352	298	10/25
COK 42N11E-16.7a	Arlington Vista Utility Co.	900	687	463	224	11/3
GOK 42N11E-26.7d	Brickman Manor Subdivision	1468	661	405	256	ll/l6
COK 42N11E-27.3a	Village of Mt. Prospect	1382	670	410	260	6/28
COK 42N11E-33.3b	Village of Mt. Prospect	1370	693	500	193	11/1
COK 42N11E-34.4g	Village of Mt. Prospect	1822	673	430	243	11/1
COK 42N11E-36.3b2	Maryville Academy	1529	651	385	266	9/20
COK 42N11E-30.3b	Village of Arlington Heights	l490	707	485	222	11/15
COK 42N10E-24.8al	Arlington Heights Jockey Club	1825	730	426	304	10/28
COK 42N10E-25.lb	City of Rolling Meadow	1530	720	448	272	10/14
COK 41N13E-8.6d	Glenview Club	1546	643	382	261	11/3
COK 41N13E-l8.5g	Avon Products, Inc.	1525	644	380	264	11/3
COK 41N13E-20.7e	Baxter Laboratory	1700	627	394	233	10/31
COK 41N13E-21.2b	G. D. Searle & Co.	1470	614	361	253	11/4
COK 41N12E-12.8b	Eugenia Subdivision	1414	666	420	246	11/3
COK 41N12E-l8.lh	Benjamin Electric Co.	1221	644	470	174	10/24
COK 41N12E-19.5g	City of Des Plaines	1811	650	430	220	3/15
COK 41N11E-10.3f	Island Lake Water Co.	1765	680	477	203	11/3
COK 41N11E-12.8h2	Village of Mt. Prospect	1369	670	485	185	11/1
COK 41N11E-13.4a	City of Des Plaines	1800	655	444	211	6/4
COK 41N11E-21.3b	Village of Elk Grove	1415	717	504	213	10/27
COK 41N11E-24.lg2	Citizens Utilities Co. of Ill.	1652	660	452	208	11/16
COK 40N12E-l8.6c	J. B. Clow & Sons, Inc.	1457	663	511	152	10/27
COK 40N12E-31.4c	Automatic Electric Co.	1900	655	582	73	10/21
COK 40N12E-31.4d	Automatic Electric Co.	1410	655	517	138	10/21
COK 39N13E-13.3c	Superior Sleeprite Corp.	1607	590	490	100	11/2
COK 39N13E-21.6g	Kropp Forge Co.	1635	608	496	112	3/31
COK 39N13E-25.2g	Ideal Roller & Mfg. Co.	111+7	598	485	113	2/22
COK 39N13E-35.1h	Liquid Carbonic Corp.	1512	594	470	124	10/31

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
COK 39N12E-4.2b2	Richardson Co.	1557	638	554	84	5/12
COK 39N12E-9.3g	City of Bellwood	1956	636	563	73	11/1
COK 39N12E-.ll.7f	Village of Maywood	1615	630	533	97	10/26
COK 39N12E-12.3e	Bowman Dairy Co.	2072	631	527	101+	10/26
COK 39N12E-13.7g	Altenheim-German Home	1661	626	526	100	11/1
COK 39N12E-25.5d	Village of Riverside	1980	620	527	93	10/23
COK 39N12E-36.8d	Village of Riverside	2047	618	525	93	10/23
COK 38N14E-5.2h	Produce Terminal Corp.	1523	590	470	120	5/26
COK 38N14E-7.6c	Fleischmann Malting Co.	1964	594	492	102	10/25
COK 38N14E-7.7g2	Standard Brands, Inc.	1791	602	493	109	8/30
COK 38N13E-11.1h	Bradshaw-Praeger & Co.	1224.	597	502	95	11/9
COK 38N13E-19.4el	Visking Corp.	1509	619	584	35	10/24
COK 38N13E-21.1f	Cracker Jack Co.	1500	620	500	120	10/10
COK 38N12E-5.8d2	Village of Western Springs	1600	678	533	145	7/5
COK 38N12E-l8.8f3	Suburban Cook Co. T.B. Sanitarium	1540	689	554	135	11/1
COK 38N12E-24.7h	Corn Products Co.	1481	597	563	34	9/30
COK 38N12E-28.7d	Fisher Body Co.	1542	605	480	125	11/14
COK 38N12E-29.1d	Fisher Body Co.	1517	605	500	105	11/14
COK 37Nl5E-8.1b2	Columbia Malting Co.	1400	587	465	122	10/20
COK 37N13E-32.5h2	Ridgeland Water Service Co.	1580	617	514	103	10/12
COK 37N11E-20.4d	Village of Lemont	1665	596	405	191	10/24
COK 36N14E-2.8e	Kaiser-Aluminum & Chemical Corp.	1730	584	352	232	8/15
COK 36N14E-3.1g	Metro Glass Co.	1704	592	381	211	8/6
COK 36N14E-34.5g	Village of Thornton	1724	612	350	262	10/25
COK 36N13E-1.2c	Miller Pre-Pared Potato Co.	1651	600	415	185	10/25

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
GOK 36N13E-9.8b2	El Vista Subdivision	1701	672	486	186	10/25
COK 35N14E-21.3h	Calumet Steel Co.	1805	614.0	410	230	10/15
DEK 42N5E-19.4.b	City of Genoa	732	830	93	737	10/27
DEK 42N5E-19.6b2	City of Genoa	730	820	79	741	10/27
DEK 42N4E-22.7a3	Village of Kingston	717	827	115	712	10/27
DSK 42N3E-26.3hl	Village of Kirkland	737	775	13	762	10/27
DEK 42N3E-26.3h2	Village of Kirkland	636	775	20	755	10/27
DEK 4lN5E-32.3e2	City of Sycamore	907	870	75	795	10/27
DEK 4lN5E-32.6c	City of Sycamore	1290	855	90	765	10/27
DEK 40N4E-15.7a	City of DeKalb	1291	855	181	674	10/4
DEK 40N4E-22.3el	City of DeKalb	1306	860	170	690	10/27
DEK 40N4E-23.2e	City of DeKalb	1330	890	184	706	10/27
DEK 40N4E-23.4d	City of DeKalb	1178	885	194	691	10/25
DEK 40N3E-23.6e	Village of Malta	125i|-	915	161	754	10/27
DEK 40N3E-23.7e	Village of Malta	853	915	133	782	10/27
DEK 40N3E-23.8el	Chicago & Northwestern Railroad	1007	910	122	788	10/27
DEK 38N5E-l5.2d	Village of Hinckley	708	740	21	719	10/26
DEK 37N5E-32.1cl	Village of Somonauk	190	685	16	669	10/26
DEK 37N5E-32.1c2	Village of Somonauk	502	685	15	670	10/26
DEK 37N5E-36.7gl	Oatman Dairy	300	655	37	618	10/26
DEK 37N5E-36.7hl	Village of Sandwich	600	661	17	644	10/26
DUP 40N11E-13.4b	Chicago, Milwaukee, St. Paul & Pacific Railroad	1378	671	510	161	11/3
DUP 40N11E-13.8el	Village of Bensenville	1445	670	520	150	10/4
DUP 40N11E-14.4e	Village of Bensenville		670	514	156	10/4
DUP 40N11E-31.5b	Village of Lombard	1793	738	528	210	11/19
DUP 40N11E-35.5e	City of Elmhurst	1476	703	594	109	11/22

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
DUP 40N10E-14.8dl	Suncrest Highlands Sewage & Water Co.	1395	750	466	284	5/2
DUP 39N11E-2.2f	City of Elmhurst	1502	690	590	100	7/29
DUP 39N11E-9.1h	Village of Villa Park	1475	695	558	137	10/24
DUP 39N11E-9.2h	Village of Villa Park	2125	699	560	139	6/6
DUP 39N11E-10.1h	City of Elmhurst	1360	669	574	95	10/24
DUP 39N11E-10.4g6	Ovaltine Food Products	1999	675	552	123	9/30
DUP 39N11E-12.8d	City of Elmhui'st	1480	677	564	113	6/24
DUP 39N10E-l.4d	Public Service Co. of N.I11.	1464	740	512	228	10/24
DUP 39N9E-l5.7h	City of West Chicago	1465	746	412	334	10/24
DUP 38N9E-13.2b3	City of Naperville	1445	680	430	250	9/12
DUP 37N11E-3.8al	Argonne National Laboratory	1595	673	493	180	11/15
GRY 34N8E-35.1e	Dresden Nuclear Power Sta.	1500	515	106	409	8/1
GRY 33N8E-36.5a	Village of Diamond	723	565	136	429	11/4
GRY 33N7E-4.4a	Brown Milling Co.	613	522	62	460	10/25
GRY 33N7E-9.3h	City of Morris	1501	519	63	456	10/25
KNE 42N8E-22.4g	Village of Carpentersville	1140	728	257	471	11/2
KNE 42N8E-22.7f	D. Hill Nursery Co.	1227	790	317	473	11/2
KNE 42N8E-27.1e	Village of West Dundee	1200	725	276	449	11/2
KNE 4.2N6E-3.le	Illinois Toll Highwav Comm. M-6	962	910	254	656	11/8
KNE 41N8E-11.3fl	City of Elgin	1945	741	345	396	10/9
KNE 41N8E-11.3f2	City of Elgin	1965	743	325	418	10/30
KNE 41N8E-11.3f4.	City of Elgin	1880	740	360	380	10/30
KNE 41N8E-11.3f5	City of Elgin	1255	740	312	428	10/30
KNE 41N8E-12.3e	Simpson Co.	998	805	389	416	11/4
KNE 41N8E-24.3b3	City of Elgin	1255	728	285	443	5/30

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
KNE 41N8E-24.6hl	Elgin National Watch Co.	1240	735	255	480	11/1
KNE 41N8E-24.6h2	Elgin National Watch Co.	1240	734	255	479	11/1
KNE 41N6E-9.lg2	Village of Burlington	1105	920	269	651	10/11
KNE 40N8E-27.6b	City of St. Charles	2200	692	197	495	11/3
KNE 40N8E-31.6h	Ill. State Training School for Boys	1322	790	265	525	11/15
KNE 40N8E-34.5g2	Howell Co.	1268	688	248	440	11/3
KNE 40N8E-34.6el	City of St. Charles	2200	764	292	472	11/3
KNE 40N6E-30.4d	C. Clyne	616	870	198	672	10/15
KNE 39N8E-2.4c	City of Geneva	2292	753	280	473	10/20
KNE 39N8E-3.1b2	City of Geneva	2217	678	213	465	10/19
KNE 39N8E-3.5e	Burgess Norton Co.	1340	760	320	440	11/3
KNE 39N8E-3.8g	City of Geneva	1578	759	305	454	10/30
KNE 39N8E-22.3el	City of Batavia	2201	667	200	467	10/28
KNE 39N8E-22.3e2	City of Batavia	2200	667	190	477	10/28
KNE 39N8E-23.8f	City of Batavia	1357	721	270	451	10/28
ME 39N8E-33.4g	Mooseheart	2200	694	248	446	10/27
KNE 39N8E-35.5g	Mooseheart	1508	704	250	454	10/27
KNE 39N7E-5.8f	Village of Elburn	1350	850	282	568	11/3
KNE 39N7E-6.3fl	Elburn Packing Co.	905	840	289	551	11/3
KNE 39N7E-10.4g	Broadview Academy	1335	790	272	518	11/3
KNE 38N8E-4.3g	Village of North Aurora	1305	675	275	400	7/18
KNE 38N8E-4.4b	Aurora Downs Racetrack	689	705	286	419	10/27
KNE 38N8E-9.2d	Mercyville	1411	697	354	343	10/27
KNE 38N8E-13.8b	Aurora Paperboard Co.	1391	696	364	332	10/28
KNE 38N8E-l5.4gl	City of Aurora	2250	646	314	332	10/27
KNE 38N8E-l5.5e	Aurora Bleaching, Inc.	1276	648	340	308	10/27
KNE 38N8E-l5.6h	Alba Mfg. Co.	1543	645	313	332	10/27
KNE 38N8E-l6.4d	City of Aurora	2152	685	374	311	10/27
KNE 38N8E-21.5h	City of Aurora	2299	673	345	328	10/27

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
KNE 38N8E-22.7c	City of Aurora	1500	628	305	323	10/27
KNE 38N8E-27.5a	City of Aurora	2185	662	325	337	10/27
KNE 38N8E-29.2h	City of Aurora	2460	665	278	387	10/27
KNE 38N8E-32.4f	Village of Montgomery	1353	640	298	342	10/27
KNE 38N8E-33.8c	Village of Montgomery	1336	633	308	325	10/27
KNK 30N9E-6.8a	Village of Reddick	1188	612	150	462	10/28
KEN 37N8E-6.2d	Caterpillar Tractor Co.	1352	661	256	405	11/3
KEN 37N8E-6.2f	Caterpillar Tractor Co.	1346	660	286	374	11/1
KEN 37N8E-17.6b	Village of Oswego	728	654	198	456	10/25
KEN 37N8E-20.8h	Village of Oswego	1378	640	228	412	10/26
KEN 37N7E-32.1el	Village of Yorkville	590	584	58	526	10/24
KEN 37N7E-32.1e2	Village of Yorkville	1335	584	72	512	11/23
LKE 46N12E-21.3d	Shiloh Park	1575	642	97	545	10/26
LKE 46N11E-27.3a	Central Pur-Food Co.	1230	672	135	537	10/26
LKE 45N11E-14.5a	Village of Gurnee	1517	665	150	515	10/25
LKE 45N11E-l5.8f	Ill.Toll Highway Comm. M-4	1045	740	216	524	10/25
LKE 45N10E-26.7b	Village of Grays Lake	1323	785	234	551	10/25
LKE 45N10E-26.8b	Village of Grays Lake	1039	785	183	602	10/25
LKE 44N12E-l8.3f2	Goodyear Tire & Rubber Co.	1600	680	238	442	10/25
LKE 44N12E-21.6g	Methodist Children's Home	900	660	195	465	10/25
LKE 44N12E-21.8f2	Village of Lake Bluff	1804	680	214	466	10/25
LKE 44N11E-l8.4a	St. Mary's of the Lake Seminary	1919	755	145	610	10/24
LKE 43N12E-31.5f	Ill. Toll Highway Comm. TP-8	1055	680	335	345	10/24
LAS 36N4E-8.5hl	Village of Leland	230	701	52	649	10/26
LAS 36N4E-8.5h2	Village of Leland	220	700		686	10/26
LAS 36N3E-18.4d2	City of Earlville	650	700	14	674	10/26
LAS 36N3E-18.4d3	City of Earlville	625	703	23	680	10/26
LAS 36N3E-18.10a	Marathon Electric Co.	150	700	35	665	10/24

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
LAS 36N1E-32.1a	City of Mendota	1450	740	94	646	10/26
LAS 35N5E-8.6b	Ill. State Industrial School	885	590	10	580	11/23
LAS 33N5E-25.4gl	U.S.Government (Civil Defense Agency)	451	505	42	463	10/25
LAS 33N2E-21.2g	Starved Rock State Park	475	470	20	450	11/2
LAS 33N2E-21.3g	Starved Rock State Park	401	470	20	450	11/2
LEE 37N2E-10.2b	Village of Paw Paw	1018	928	192	736	10/26
LEE 37NlE-8.8e3	Village of West Brooklyn	650	945	197	748	10/26
LIV 30N8E-26.8h	Cardiff	1785	633	124.	509	10/28
I.IV 30N6E-1.2a	Ill. State Reformatory for Women	1203	645	199	446	10/28
MCH 46N5E-33.8a	Dean Milk Co	1610	890	173	717	10/27
MCH 45N8E-10.8d	Morton Chemical Co.	1161	850	250	600	10/27
MCH 44N9E-20.1b	Island Lake Water Co.	1223	775	240	535	10/27
MCH 44N8E-33.5a	City of Crystal Lake	1555	930	354	576	10/28
MCH 44N5E-35.3g	City of Marengo	1028	817	105	712	10/27
MCH 44N5E-35.5h	Arnold Engineering Co.	846	818	97	721	11/8
MCH 43N8E-5.4g	City of Crystal Lake	1218	917	360	557	10/28
OGL 40N2E-23.1f	Village of Creston	737	905	125	780	10/27
OGL 40N1E-24.5h	City of Rochelle	925	795	35	760	10/27
OGL 40NlE-24.7al	City of Rochelle	1484	793	60	733	10/27
OGL 40NlE-24.7a2	City of Rochelle	1450	793	59	734	10/27
OGL 40N1E-25.3f	City of Rochelle	867	800	77	723	10/27
OGL 40N1E-25.8h	City of Rochelle	1896	780	75	705	10/27
WIL 37N10E-25.7c	Pure Oil Co.	1456	590	410	180	10/25
WIL 37N10E-26.1a	Pure Oil Co.	1466	589	426	163	10/25
WIL 36N10E-2.8f	Public Service Co.of N. Ill. Sta. 18	1507	590	412	178	10/25
WIL 36N10E-l6.4d	Revere Copper & Brass Co.	1523	666	487	179	11/9
WIL 36N10E-23.2f	City of Lockport	1572	650	503	147	10/1

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
WIL 36N10E-23.5a	City of Lockport	1571	662	490	172	10/9
WIL 36N10E-23.6c	City of Lockport	1446	589	459	130	10/3
WIL 36N-10E-27.6b	U. S. Army Lockport Locks	815	581	437	144	11/9
WIL 36N10E-28.6f2	Ill. State Penitentiary, Stateville	2007	642	507	135	ll/l
WIL 36N10E-28.6g	Ill. State Penitentiary, Stateville	1600	645	502	143	9/2
WIL 36N10E-28.6h	Ill. State Penitentiary, Stateville	1600	645	480	165	9/2
WIL 36N10E-29.2g	Ill. State Penitentiary, Stateville	1665	646	498	148	10/24
WIL 36N10S-32.1a	Lidice Subdivision	1652	659	531	128	9/22
WIL 36N10E-33.6h	Public Service Co. of N. Ill., Sta. 55	1558	593	459	134	10/17
WIL 36N10E-33.8e	. Lidice Subdivision	1060	630	487	143	10/12
WIL 36N10E-34.8a	Ruberoid Co.	776	551	484	67	11/2
WIL 36N9E-10.8d	Village of Plainfield	1481	622	342	280	10/25
WIL 35N11E-8.8h	City of Joliet (Hadley Valley)	1701	674	557	117	10/17
WIL 35N10E-3.4e	Ill. State Penitentiary	1518	560	492	68	11/2
WIL 35N10E-3.5e	Ill. State Penitentiary	1660	549	426	123	11/1
WIL 35N10E-4.2h	Phoenix Mfg. Co.	1595	553	449	104	10/18
WIL 35N10E-9.1d	City of Joliet	1621	536	431	105	11/7
WIL 39N10E-10.1a	Wm.E. Pratt Mfg. Co.	1505	551	487	64	11/7
WIL 35N10E-10.6a	Joliet Twp. High School	881	535	440	95	10/18
WIL 35N10E-11.6g	. E. J. & E. R. R.	1589	560	416	144	10/24
WIL 35N10E-16.2h	City of Joliet	1575	531	390	141	10/17
WIL 35N10E-20.6a	Public Service Co. of N.I11. Sta. 9	1487	536	432	104.	10/9
WIL 35N10E-20.7g	Village of Rockdale	1586	556	443	113	11/14
WIL 35N10E-21.4b	American Cyanamid Co.	1612	583	456	127	10/14
WIL 35N10E-22.3f	Will County Sanitarium	861+	622	464	158	10/18

Table 4 - (continued)

Well No.	Owner	Depth of well (feet)	Surface elevation	Depth to water (feet)	Water level elevation	Date 1960
WIL 35N10.E-22.7g	American Institute of Laundering	1608	569	398	171	10/18
WIL 35N10E-30.3C	Blockson Chemical Co.	1498	543	520	23	9/21
WIL 35N10E-30.6e	Caterpillar Tractor Co.	1543	546	412	134	9/2
WIL 35N10E-30.7f	Caterpillar Tractor Co.	1510		436	108	9/2
WIL 34N9E-10.1h	American Oil Co.	1422	544 568	378	188	10/4
WIL 34N9E-11.2e	Stepan Chemical Co.	1407	525	334	191	11/10
WIL 34N9E-11.7g	American Oil Co.	1422	569	379	190	10/24
WIL 33N9E-1.5el	Joliet Arsenal, Kankakee	935	572	230	342	10/17
WIN 44N2E-l8.6b	City of Rockford	1312	780	102	678	7/28
WIN 44N2E-20.3e	City of Rockford	1457	820	167	653	11/9
WIN 44N2E-31.7f	City of Rockford	1372	790	102	688	7/28
WIN 44N1E-2.3b	City of Rockford	1127	760	62	698	7/28
WIN 44N1E-21.8e	City of Rockford	1355	810	127	683	10/27
WIN 44N1E-23.7e	City of Rockford	1530	721	25	696	10/27
WIN 44N1E-34.6h	City of Rockford	1219	730	49	681	7/28
WIN 44N1E-36.7fl	City of Rockford	1503	732	81	651	10/27

Table 5 - Decline in Water Levels in Deep Wells During 1960

Well No.	Owner	Water Level Elevation 1959	Water Level Elevation 1960	Date of Measurements	Change in Water Level Elevation (feet)
BNE 44N3E-24.8a	City of Belvidere	720	730	10/59-11/60	+10*
BNE 44N3E-35.1e2	City of Belvidere	736	739	10/59-11/60	+3
COK 42N12E-2.5b	Green Acre Country Club	382	356	11/59-10/60	26
COK 42N12E-14.2cl	Sunset Ridge Country Club	321	303	11/59-10/60	18
COK 42N12E-28.7e	Signode Steel Strapping Co.	391	368	11/59-11/60	23
COK 42N12E-29.la	Illinois Municipal Water Co.	317	292	11/59-11/60	25
COK 42N11E-11.6e	Village of Wheeling	325	288	11/59-10/60	37
COK 42N11E-11.8b2	Ekco Foil Container Corp.	323	298	11/59-10/60	25
COK 42N11E-l6.7a	Arlington Vista Subdivision	250	224	10/59-11/60	26
COK 42N11E-26.7d	Citizens Utilities Co. of Ill.	296	256	10/59-11/60	40
COK 42N11E-34.4g	Village of Mt. Prospect	295	243	10/59-11/60	52
COK 42N10E-24.8al	Arlington Heights Jockey Club	319	304	10/59-10/60	15
COK 41N13E-8.6d	Glenview Club	275	261	11/59-11/60	
COK 41N13E-20.7e	Baxter Laboratory	251	233	11/59-10/60	14
COK 41N13E-21.2b	G. D. Searle & Co.	264	253	11/59-11/60	11
COK 41N12E-12.8b	Eugenia Subdivision	286	246	11/59-11/60	40
COK 41N11E-10.3f	Hatlen Heights Subdivision	214	203	10/59-11/60	11
COK 41N11E-21.3b	Village of Elk Grove	237	213	11/59-10/60	24
COK 40N12E-l8.6c	J. B. Clow & Sons Inc.	173	152	11/59-10/60	21
COK 40N12E-31.4c	Automatic Electric Co.	86	66	11/59-10/60	20
COK 40N12E-31.4d	Automatic Electric Co.	140	138	11/59-10/60	2
COK 39N13E-13.3c	Superior Sleeprite Corp.	114	100	11/59-11/60	14
COK 39N13E-21.6g	Kropp Forge Co.	85	112	11/59-3/60	+27
COK 39N13E-25.2g	Ideal Roller & Mfg. Co.	114	113	11/59-2/60	1
COK 39N13E-35.1h	Liquid Carbonic Corp.	128	124	10/59-10/60	4
COK 39N12E-11.7f	Village of Maywood	118	97	10/59-10/60	21
COK 39N12E-12.3e	Bowman Dairy Co.	164	104	11/59-10/60	60
COK 39N12E-25.5d	Village of Riverside	113	93	10/59-10/60	20
COK 39N12E-36.8d	Village of Riverside	103	93	10/59-10/60	10
COK 38N14E-7.6c	Fleischmann Malting Co.	116	102	11/59-10/60	14
COK 38N13E-11.1h	Bradshaw-Praeger & Co.	112	95	11/59-11/60	17
COK 38N13E-19.4el	Visking Corp.	74	35	10/59-10/60	39

Table 5 - (continued)

Well No.	Owner	Water Level Elevation 1959	Water Level Elevation 1960	Date of Measurements	Change in Water Level Elevation (feet)
COK 38N13E-21.1f	Cracker Jack Co.	120	120	10/59-10/60	0
COK 38N12E-5.8d2	Village of Western Springs	150	145	10/59-7/60	5
COK 38N12E-18.8f3	Suburban Cook Co, T.B. Sanitarium	154	135	10/59-11/60	19
COK 38N12E-24.7h	Corn Products Co.	59	34	10/59-9/60	25
COK 38N12E-28.7d	Fisher Body Co.	125	125	11/59-11/60	0
COK 37N15E-8.1b2	Columbia Malting Co.	140	122	10/59-10/60	18
COK 37N11E-20.4d	Village of Lemont	196	191	11/59-10/60	5
COK 36N14E-3.1g	Metro Glass Co.	162	211	10/59-8/60	+4.9
COK 36N13E-1.2c	Miller Pre-Pared Potato Co.	205	185	10/59-10/60	20
COK 35N14E-21.3h	Calumet Steel Co.	250	230	10/59-10/60	20
DEK 42N5E-19.4b	City of Genoa	745	737	10/59-10/60	8
DEK 42N5E-19.6b2	City of Genoa	745	741	10/59-10/60	4
DEK 42N4E-22.7a3	Village of Kingston	715	712	IO/59-IO/6O	3
DEK 42N3E-26.3hl	Village of Kirkland	763	762	IO/59-IO/6O	1
DEK 42N3E-26.3h2	Village of Kirkland	759	755	10/59-10/60	4
DEK 41N5E-32.6c	City of Sycamore	761	765	11/59-10/60	+4
DEK 40N4E-15.7a	City of DeKalb	687	674	IO/59-IO/60	13
DEK 40N4E-22.3el	City of DeKalb	693	690	10/59-10/60	3
DEK 40N4E-23.4d	City of DeKalb	694	691	10/59-10/60	3
DEK 40N3E-23.6e	Village of Malta	751	754	10/59-10/60	+3
DEK 40N3E-23.7e	Village of Malta	767	782	10/59-10/60	+15
DEK 40N3E-23.8el	Chicago & Northwestern Railroad	786	788	11/59-10/60	+2
DEK 38N5E-15.2d	Village of Hinckley	717	719	10/59-10/60	+2
DEK 37N5E-32.1cl	Village of Somonauk	668	669	10/59-10/60	+1
DEK 37N5E-32.1c2	Village of Somonauk	670	670	10/59-10/60	0
DEK 37N5E-36.7hl	Village of Sandwich	641	644	10/59-10/60	+3
DEK 37N5E-36.7h2	Village of Sandwich	637	650	10/59-10/60	+13
DUP 40N11E-13.8el	Village of Bensenville	186	157	11/59-10/60	29
DUP 40N11E-14.4e	Village of Bensenville	182	156	10/59-10/60	26
DUP 40N11E-31.5b	Village of Lombard	214	210	11/59-11/60	
DUP 40N11E-35.5e	City of Elmhurst	115	109	10/59-11/60	4
DUP 39N11E-9.2h	Village of Villa Park	141	139	11/59-6/60	2
DUP 39N11E-10.1h	City of Elmhurst	95	95	10/59-10/60	0
DUP 39N10E-1.4d	Public Service Co. of N. Ill.	222	228	11/59-10/60	+6
DUP 38N9E-13.2b3	City of Naperville	255	250	10/59-9/60	5

Well No.	Owner	Water Level Elevation 1959	Water Level Elevation 1960	Date of Measure-ments	Change in Waterr Level Elevation (feet)
GRY 34N8E-35.le	Dresden Nuclear Power Sta.	418	409	11/59-8/60	9
GRY 33N8E-36.5a	Village of Diamond	439	429	12/59-11/60	10
GRY 33N7E-4.4a	Brown Milling Co.	484	460	10/59-10/60	24
GRY 33N7E-9.3h	City of Morris	453	456	10/59-10/60	+3
KNE 42N8E-22.4g	Village of Carpenters-ville	495	471	10/59-11/60	24
KNE 42N8E-27.1e	Village of West Dundee	458	449	10/59-11/60	9
KNE 42N6E-3.1e	Ill. Toll Highway Coram. M-6	665	656	10/59-11/60	9
KNE 41N8E-11.3f2	City of Elgin	437	418	10/59-10/60	19
KNE 41N8E-11.3f4	City of Elgin	375	380	10/59-10/60	+5
KNE 40N8E-27.6b	City of St. Charles	467	495	10/59-11/60	+28
KNE 40N8E-31.6h	Ill. State Training School for Boys	538	525	10/59-11/60	13
ME L+0N8E-3i+.6el	City of St. Charles	452		10/59-11/60	+20
KNE 39N8E-3.1b2	City of Geneva	485	472	10/59-10/60	20
KNE 39N8E-22.3el	City of Batavia	465	465 467	10/59-10/60	+2
KNE 39N8E-22.3e2	City of Batavia	472	477	10/59-10/60	+5
KNE 39N8E-23.8f	City of Batavia	457	451	10/59-10/60	6
KNE 39N8E-33.4g	Mooseheart	452	446	10/59-10/60	6
KNE 39N8E-33.5g	Mooseheart	488	454	10/59-10/60	34
KNE 39N7E-5.8f	Village of Elburn	617	568	10/59-11/60	49
KNE 38N8E-9.2d	Mercyville Institute	365	343	10/59-10/60	22
KNK 30N9E-6.8a	Village of Reddick	455	462	10/59-10/60	+7
KEN 37N8E-6.2d	Caterpillar Tractor Co.	415	405	10/59-11/60	10
KEN 37N8E-6.2f	Caterpillar Tractor Co.	382	374	10/59-11/60	8
KEN 37N8E-17.6b	Village of Oswego	453	456	10/59-11/60	+3
KEN 37N7S-32.1el	Village of Yorkville	544	526	10/59-11/60	18
LKE 46N12E-21.3d	Shiloh Park	550	545	10/59-10/60	5
LKE 46N11E-27.3a	Central Fur-Food Corp.	547	537	10/59-10/60	10
LKE 45N11E-l5.8f	Ill.Toll Highway Comm. M-L+	529	524	10/59-10/60	5
LKE 45N10E-26.7b	Village of Grays Lake	567	551	10/59-10/60	16
LKE 44N12E-21.8f2	Village of Lake Bluff	459	466	10/59-10/60	+7
LKE 44N11E-l8.4a	St. Marys of the Lake Seminary	599	610	10/59-10/60	+11
LKE 43N12E-31.5f	Ill.Toll Highway Comm. TP-8	368	345	10/59-10/60	23

Table 5 - (continued)

Well No.	Owner	Water Level Elevation 1959	Water Level Elevation 1960	Date of Measure-ments	Change in Water Level Elevation (feet)
LAS 36N4E-8.5hl	Village of Leland	648	649	10/59-10/60	+1
LAS 36N4E-8.5h2	Village of Leland	684	686	10/59-10/60	+2
LAS 36N3E-18.4d3	City of Earlville	668	680	10/59-10/60	+12
LAS 36N1E-32.1a	City of Mendota	640	646	6/59-10/60	+6
LAS 35N5E-8.6b	Ill. State Industrial School	575	580	10/59-11/60	+5
LEE 37N2E-10.2b	Village of Paw Paw	734	736	10/59-10/60	+2
LIV 30N8E-26.8h	Cardiff	518	509	10/59-10/60	9
MCH 46N5E-33.8a	Dean Milk Co.	711	707	10/59-10/60	4
MCH 45N8E-10.8d	Morton Chemical Co.	618	600	10/59-10/60	18
MCH 44N9E-20.1b	Island Lake Water Co.	545	535	11/59-10/60	10
MCH 44N8E-33.5a	City of Crystal Lake	611	576	10/59-10/60	35
MCH 44N5E-35.3g	City of Marengo	699	712	10/59-10/60	+13
MCH 43N8E-5.4g	City of Crystal Lake	593	557	10/59-10/60	36
OGL 40N2E-23.1f	Village of Creston	777	780	10/59-10/60	+3
OGL 40N1E-24.7al	City of Rochelle	732	733	10/59-10/60	+1
WIL 36N10E-l6.4d	Revere Copper & Brass Co.	189	179	9/59-11/60	10
WIL 36N10E-23.2f	City of Lockport	158	147	10/59-10/60	11
WIL 36N10E-23.5a	City of Lockport	186	172	10/59-10/60	14
WIL 36N10E-23.6c	City of Lockport	154	130	10/59-10/60	24
WIL 36N10E-27.6b	U.S. Army - Lockport Locks	149	144	11/59-11/60	5
WIL 36N10E-28.6f2	Ill. State Penitentia-ry, Stateville	138	135	11/59-11/60	3
WIL 36N10E-28.6h	Ill. State Penitentia-ry, Stateville	165	165	10/59-9/60	0
WIL 36N10E-29.2g	Ill. State Penitentia-ry, Stateville	156	148	10/59-10/60	8
WIL 36N10E-32.1a	Lidice Subdivision	162	128	11/59-9/60	34
WIL 36N10E-33.6h	Public Service Co. of N. Ill. Sta 55	148	134	11/59-10/60	14
WIL 36N10E-34.8a	Ruberoid Co.	71	67	11/59-11/60	4
WIL 35N11E-8.8h	City of Joliet (Hadley Valley)	141	117	11/59-10/60	24
WIL 35N10E-3.4e	Ill. State Penitentiary	96	68	11/59-11/60	28
WIL 35N10E-3.5e	Ill. State Penitentiary	127	123	11/59-11/60	4
WIL 35N10E-4.2h	Phoenix Mfg. Co.	117	104	11/59-10/60	13

Table 5 - (continued)

Well No.	Owner	Water Level Elevation 1959	Water Level Elevation 1960	Date of Measurements	Change in Water Level Elevation (feet)
WIL 35N10E-9.1d	City of Joliet	122	105	10/59-11/60	17
WIL 35N10E-10.1a	Wm. E. Pratt Mfg. Co.	88	64	11/59-11/60	24
WIL 35N10E-10.6a	Joliet Twp. High School	105	95	11/59-10/60	10
WIL 35N10E-16.2h	City of Joliet	149	141	11/59-10/60	8
WIL 35N10E-20.6a	Public Service Co. of No. Ill. Sta. 9	128	104	10/59-10/60	24
WIL 35N10E-20.7g	Village of Rockdale	119	113	11/59-11/60	6
WIL 35N10E-21.4b	American Cyanamid Co.	144	127	11/59-10/60	17
WIL 35N10E-22.7g	American Institute of Laundering	178	171	11/59-10/60	7
WIL 35N10E-30.6e	Caterpillar Tractor Co.	146	134	9/59-9/60	12
WIL 35N10E-30.7f	Caterpillar Tractor Co.	122	108	9/59-9/60	14
WIL 34N9E-10.1h	American Oil Co.	248	188	9/59-10/60	60
WIL 34N9E-11.2e	Stepan Chemical Co.	220	191	11/59-11/60	29
WIL 33N9E-1.5el	Joliet Arsenal, Kankakee	347	340	10/59-10/60	7
WIN 44N1E-23.7e	City of Rockford	681	696	10/59-10/60	+15

÷ + indicates rise in water level.

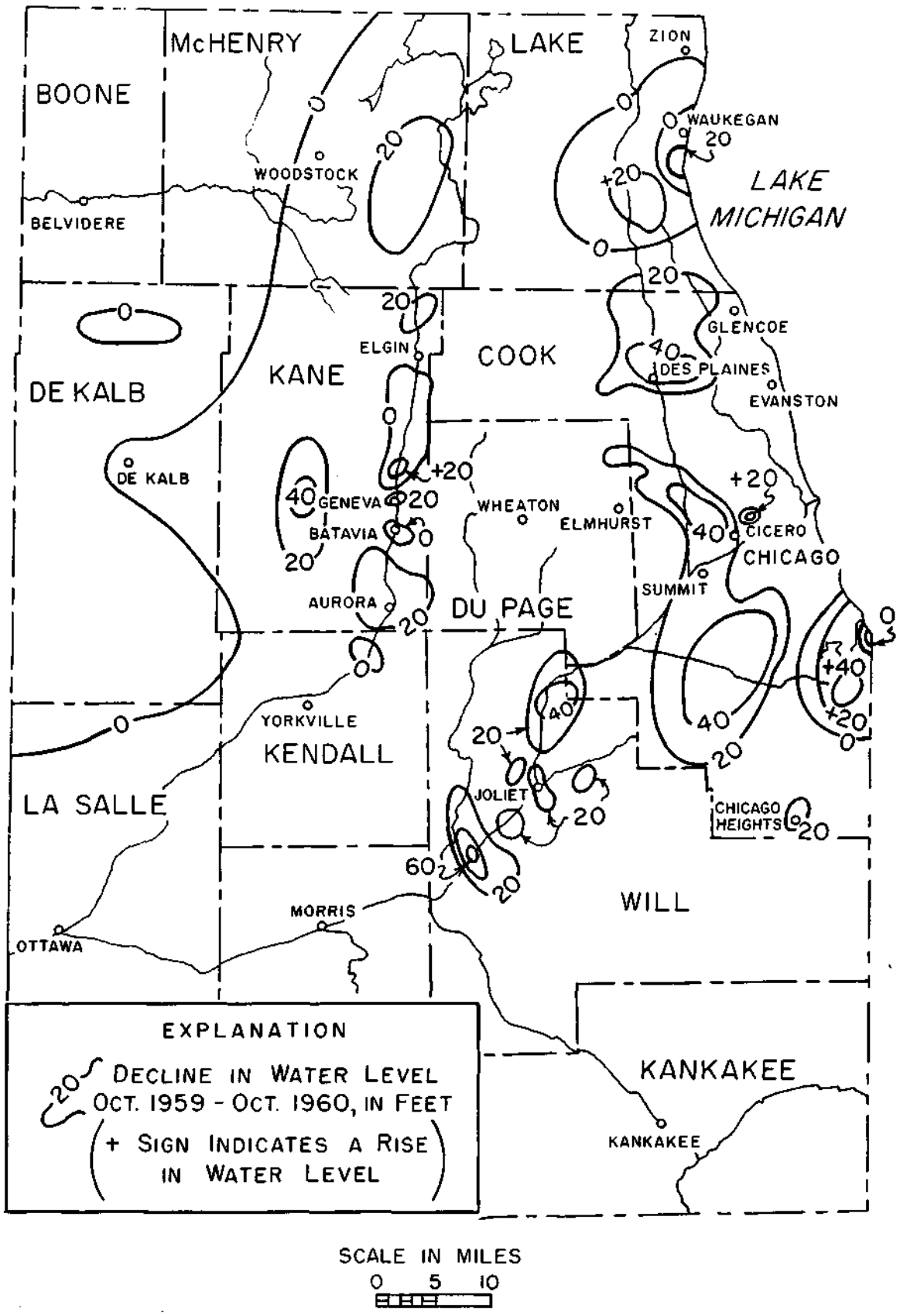


Figure 7. MAP SHOWING CHANGES IN WATER LEVELS IN DEEP WELLS DURING 1960

Aurora areas. The declines in water levels, October 1959 to October 1960, in the Chicago, Joliet, Des Plaines, and Aurora areas are several feet greater than the average annual rate of water-level decline for the period 1945-1959. The average decline, October 1959-October 1960, in the Elmhurst area pumping center is less than the average decline, 1945-1959, because the increase in pumpage during 1960 at Elrahurst was negligible.,

Superimposed upon the long-term trend of water-level fluctuations in deep wells are seasonal fluctuations caused chiefly by changes in the rate of pumping from nearby wells. Water levels in deep wells in many parts of the Chicago region generally recede during the summer and early fall months, when pumpage is the greatest. Water levels start to recover during the late fall, when pumpage is reduced. Minimum annual water levels are usually recorded during September and October; maximum annual water levels occur during late winter and spring months. Short-term fluctuations reflect intermittent pumping, day-to-day variations in nearby pumping, or changes in atmospheric pressure.

As shown by the hydrograph for a well near the village of Malta given in figure 8, the daily and seasonal range in water-level fluctuations in deep wells remote from pumping centers is small. Malta is in the recharge area of the Cambrian-Ordovician Aquifer and is about 65 miles west of Chicago. In the recharge area seasonal variations in water levels closely resemble the annual cycle of water-level changes in shallow wells. The rise of water levels is especially pronounced in the wet spring

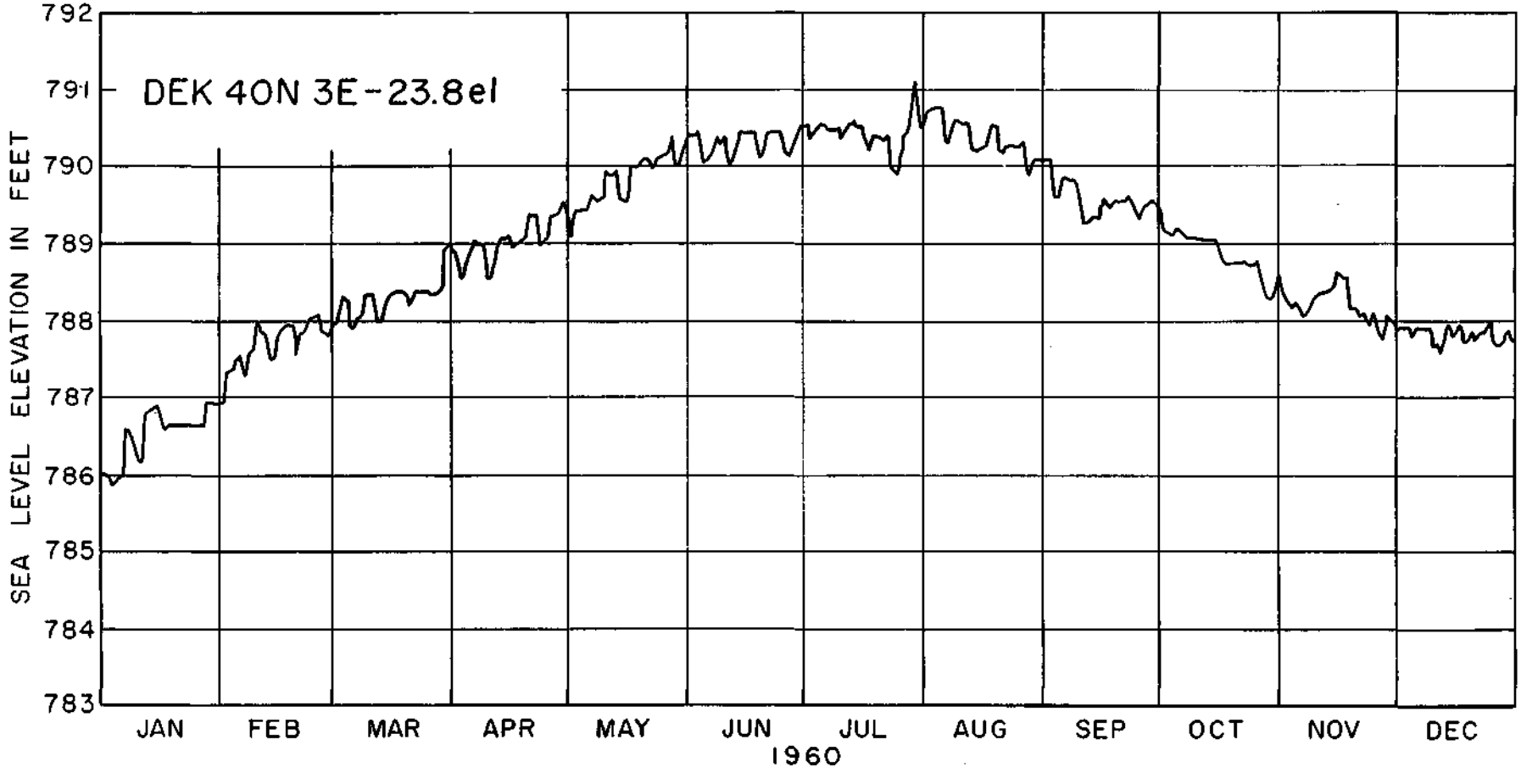


Figure 8. WATER LEVELS AT MALTA DURING 1960

months. The 2-foot rise in the water level at Malta, January through December 1960, is in sharp contrast to the l8-foot decline in the water level at Maywood during the same period.

A well at the city of Zion near the Illinois-Wisconsin state line was equipped with a recording gage in July 1959. The hydrograph for the well is given in figure 9. The decline in the well, October 1959-October 1960, about 5 feet, is much less than the average decline, about 13 feet, in the Chicago region during 1960.

Piezometric Surface of Cambrian-Ordovician Aquifer in 1960

The piezometric surface is an imaginary surface to which water will rise in artesian wells. Figure 10 shows the piezometric surface of the Gambrian-Ordovician aquifer in October 1960. Data on nonpumping water levels in table 4 were used to prepare the map. The general features of the piezometric surface map for 1960 differ but little from those of the piezometric surface map for 1959 as shown in Circular 79.

During 1960 the area of lowest water levels in the Chicago area continued to advance in a northwesterly direction from Summit towards the Elmhurst and Des Plaines areas. The 150-foot piezometric surface contour migrated in a northwesterly direction about two miles from its estimated position in 1959. In 1960, the deepest cone of depression in Cook County (about 34 feet above sea level) was in the vicinity of Summit.

A pronounced cone of depression is centered in the southwest part of Joliet where large quantities of water are pumped for

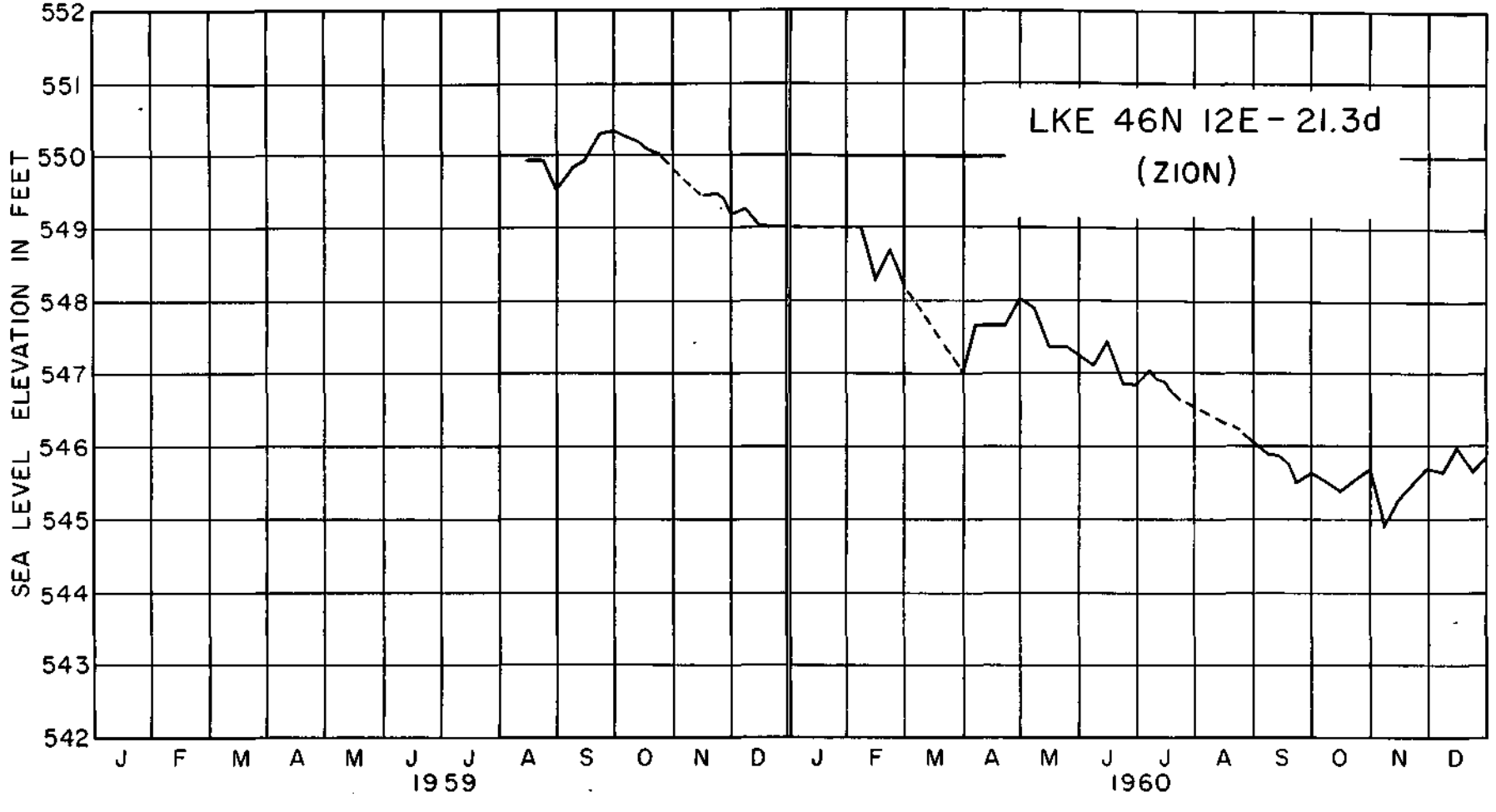


Figure 9. WATER LEVELS AT ZION DURING 1959 AND 1960

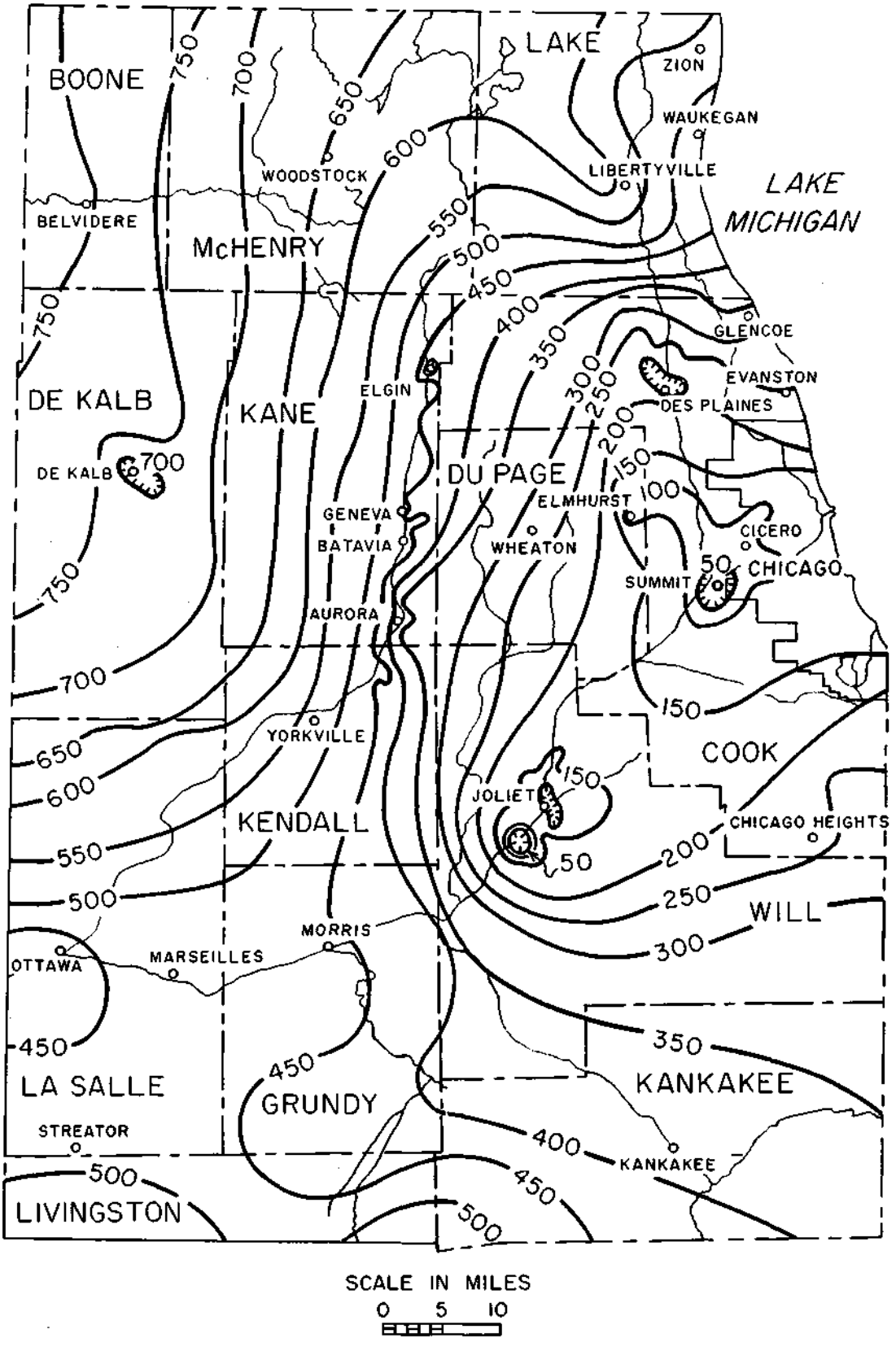


Figure 10. ELEVATION OF PIEZOMETRIC SURFACE OF CAMBRIAN-ORDOVICIAN AQUIFER IN OCTOBER, 1960

industrial use. The average elevation of water levels in deep wells within the corporate limits of Joliet was about 100 feet above sea level in 1960.

The general rise of water levels in the Libertyville area changed the piezometric surface in parts of Lake County. The 500-foot, 550-foot, and 600-foot contours migrated several miles in a southeasterly direction as the result of decreases in pumpage.

Depressions in the piezometric surface are apparent at Summit, Joliet, Elgin, Geneva, Batavia, Elmhurst, Des Plaines, DeKalb, and Aurora, The piezometric surface was below the top of the Galena-Platteville Dolomite in the deepest parts of the cones of depression at Chicago, Elmhurst, Des Plaines, and Joliet.

The general pattern of flow of water in the Cambrian-Ordovician Aquifer in 1960 was slow movement from all directions toward the deep cones of depression centered west of Chicago at Summit and Joliet. Some of the water flowing toward Chicago and Joliet is intercepted by cones of depression in the Aurora, Elgin, Des Plaines, and Elmhurst areas.

The lowering of the water levels accompanying the withdrawals of ground water has established steep hydraulic gradients west and north of Chicago, and large quantities of water are at present being transmitted from recharge areas in northern Illinois and minor quantities from southern Wisconsin toward centers of pumping. Large amounts of water derived from storage within the Cambrian-Ordovician Aquifer and from vertical leakage of water through the Maquoketa Formation move toward Chicago and Joliet from the east in Indiana, from the south in Illinois, from the west in Illinois, and from the northeast beneath Lake Michigan,,

Future Water-Level Decline

Estimates of future nonpumping water-level decline, 1958-1980, based on reasonable extrapolation of past pumpage data, were given in Cooperative Report 1. Average declines ranged from about 14 feet per year in the Chicago and Des Plaines areas to about 9 feet per year in the Elgin area. The measured declines during 1959 and 1960 exceeded the predicted declines because of the record high rate of increase in pumpage in 1959 and the above average rate of increase in pumpage in 1960. Pumpage increases vary from year to year in an erratic and unpredictable manner. Judging from past records it is unlikely that pumpage will increase indefinitely at the rates observed during 1959 and 1960. By the same token,, it is unlikely that water-level declines will persist indefinitely at the rates observed during 1959 and 1960. However, declines during 1959 and 1960 are so much in excess of predicted declines that, barring appreciable reductions in pumpage in some future years, water-level declines will exceed predicted declines given in Cooperative Report 1. It is important that collection of data be continued so that potential ground-water development and its effects can be reevaluated within five years.